

CLAIMS

We claim:

1. A liquid level maintaining device for monitoring the surface level of a body of liquid and controllably supplying make-up liquid from a liquid source to maintain the surface level of the body of liquid at a set level, the liquid level maintaining device comprising:

a container forming a reservoir that is sufficiently deep to hold the body of liquid;

a flow path between the liquid source and said reservoir, the make-up liquid being biased to flow from said liquid source along said flow path to said reservoir;

a flow restrictor positioned along said flow path to restrict the make-up liquid to a desired volumetric flow rate as the make-up liquid flows along said flow path;

a pilot with a pressure sensing port and a pressure transmitting passageway filled with a gas, said pilot being secured to maintain said port at a fixed level relative to said reservoir, said fixed level being below the surface level of the body of liquid, and said gas being in pressurized communication with a surface of the liquid proximal said gas in said pilot;

a pilot controlled sequence valve having a liquid inlet, a liquid outlet, a control chamber and a pressure activated valve mechanism movable between open and closed positions, said control chamber being in pressure transmitting communication with said gas in said pressure transmitting passageway, and said valve mechanism moving to its said open position to open a pathway between said inlet and outlet when said control chamber is below a predetermined pressure, and moving to its said closed position to close said pathway when said control chamber is at least equal to said predetermined pressure; and,

wherein the sequence valve moves to said open position and the make-up liquid flows from the liquid source to said reservoir when the surface level of the body of liquid drops to a lower level, and said sequence valve moves back to its said closed position when the surface level of the body of liquid rises to the set level.

2. The liquid level maintaining device of Claim 1, and wherein said valve mechanism is an elastic diaphragm that sealingly separates said control chamber from an ambient chamber, said ambient chamber being in fluid communication with external air via an air vent, in fluid communication with said liquid outlet, and in fluid communication with said liquid inlet when said diaphragm is in an open position.

3. The liquid level maintaining device of Claim 2, and wherein said liquid outlet is located at a lower end of said ambient chamber, said air vent is located at an upper end of said ambient chamber, and said liquid inlet is located proximal a center of said ambient chamber, said ambient chamber being in continuous fluid communication with said air vent and said liquid outlet.

4. The liquid level maintaining device of Claim 2, and wherein said elastic diaphragm includes a central stiffening disk, and said elastic diaphragm flexes under pressure in a donut-shaped area around said stiffening disk.

5. The liquid level maintaining device of Claim 2, and wherein said flow restrictor is a nozzle located along said inlet of said sequence valve that discharges the make-up liquid into said diaphragm.
6. The liquid level maintaining device of Claim 5, and wherein said nozzle has a discharge opening and said diaphragm engages and closes said discharge opening when said diaphragm is in a closed position, and said diaphragm moves away from and opens said discharge opening when said diaphragm is in an open position.
7. The liquid level maintaining device of Claim 2, and wherein the liquid source is located above said reservoir and the make-up liquid is biased by gravity to flow along said flow path toward said reservoir.
8. The liquid level maintaining device of Claim 2, and wherein the liquid source is a pressurized system having at least a given pressure, and the make-up liquid is biased by said pressurized system to flow along said flow path toward said reservoir.
9. The liquid level maintaining device of Claim 8, and further comprising a pressure regulator located along said flow path between said the liquid source and said pilot controlled sequence valve.

10. The liquid level maintaining device of Claim 1, and wherein the body of liquid and make-up liquid are water, and said gas in said passageway of said pilot and said control chamber of said sequence valve is air.

11. The liquid level maintaining device of Claim 10, and wherein said liquid level maintaining apparatus is adapted to operate in an ambient air environment where the air external to said liquid level maintaining device is at atmospheric pressure, and said air in said pilot has a pressure about equal to said atmospheric pressure when said surface level of the body of liquid is at said lower level.

12. The liquid level maintaining device of Claim 1, and wherein said container is a plant container with an upper portion having a floor and an outer wall for holding a plant and soil for the plant, said plant container including a lower portion that forms said reservoir, said floor of said upper portion having openings to allow the root system of the plant to extend into said reservoir.

13. The liquid level maintaining device of Claim 12, and wherein said plant container and said reservoir are an integrally molded part.

14. The liquid level maintaining device of Claim 12, and wherein said sequence valve and said pilot are secured to one of either said reservoir and said plant container, said lower end of said pilot being held at a fixed position below the surface level of the body of liquid.

15. The liquid level maintaining device of Claim 14, and wherein said flow path downstream of said sequence valve includes a feed tube, and said feed tube is secured to and held in a fixed position by said plant container, said sequence valve is secured to and held in a fixed position by said feed tube, and said pilot is secured to and held in a fixed position by said sequence valve via a pilot tube.

16. The liquid level maintaining device of Claim 15, and wherein said pilot has an outer wall with a rim that defines an open lower end, said pilot having a given diameter proximal said rim, and said feed tube has an outer wall with an inside diameter, and said given diameter of said pilot proximal said rim is substantially equal to said inside diameter of said feed tube.

17. The liquid level maintaining device of Claim 12, and wherein said pressure transmitting passageway of said pilot has a barrier to prevent the root system of the plant from entering said pressure transmitting passageway while allowing the water pressure of the reservoir to be communicated with said gas in said pilot.

18. The liquid level maintaining device of Claim 6, and wherein the make-up liquid is flowing at a high flow rate, and said discharge opening of said nozzle has at least one notch that forms a leak pathway for said make-up liquid when said diaphragm approaches its said closed position, and said elastic diaphragm deforms over said notch when in said substantially closed position to close said leak pathway.